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SIPBI : A GEOGRAPHIC INFORMATION SYSTEM FOR DISASTER MANAGEMENT IN INDONESIA

by
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ABSTRACT

Disaster occurs when natural hazards affect human society. Development of a Geographic Information System (GIS) for disaster management, called SIPBI is designed as a management system for handling the disaster data and hazard maps stored at the database. In order to support the disaster management efforts, several aspects such as geophysics, socio culture, and public health data are mostly needed at all phases of disaster management. The two main objectives of SIPBI are to accelerate the availability of information, and maximizing the disaster management system.

Keywords : GIS, Disaster Management, Information System.

INTRODUCTION

Background

Being situated geographically and geologically on active volcanic belt, tropical rain area, and being located close to the convergent tectonic plate boundaries make Indonesian territory highly vulnerable to natural disasters (Sudibyakto and Haroonah, 1997). Disaster occurs when natural hazards affect human society. They both interact and form a system. As a system, natural disaster consists of body and process (Jinfeng, 1998). He, then, explained that the body refers to the material component, which forms the structure and component of the system, including disaster producer-factors causing disasters, and disaster receives-disaster burden. The process refers to dynamic behavior and relationship between the components and the media for the interaction between them.

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Natural disasters which frequently occur in the Indonesian territory are : landslides, floods, droughts, volcanic eruptions, earthquakes, and shallow sea earthquakes which cause tsunami. A disaster has double impacts; this is to say both the positive and negative impacts depending on the type of disaster; its location and the intensity thereof. In order to minimize its negative impacts, the forthcoming disaster ought to be managed so that it will not affect the development process of the affected country. The disaster management efforts have to be planned, directed, continuous, and integrated in order to achieve its purpose (Sudibyakto and Haroonah, 1997).

Based on the number of theories and concepts, disaster management includes : the responsive actions or emergency perceptive phase, reconstruction phase, and rehabilitation phase. The disaster management efforts need an endorsement of Geographic Information System which is reliable and accessable to the National Coordination Board for Disaster Management (Bakornas PB, Badan Koordinasi Nasional Penanggulangan Bencana), Disaster Management Coordinating and Implementing Unit of the Province (Satkorlak PB, Satuan Koordinasi Pelaksanaan Penanggulangan Bencana), Disaster Management Implementing Unit of the Regency (Satlak PB, Satuan Pelaksana Penanggulangan Bencana) and all the interrelated institutions. In order to support the disaster management efforts, a geographical data and information system consisting of several aspects such as Geophysical, Biological, Socio-Cultural, and Public Health data are mostly needed at all phases of Disaster Management (Disaster Prevention, Disaster Preparedness, and Disaster Relief) and must therefore be put in place (Sudibyakto and Haroonah, 1997).

SIPBI (Sistem Informasi Penanggulangan Bencana Indonesia) strength relies on the Satlak PB of the respective regencies in coordination with the local Disaster Management Coordinating and Implementing Units because in these units, the basic data required such as thematic maps (Administration map, Hazard map, Landuse map, Isohyetal map, and Public Utility map) and the like, statistical data and other important pieces of information are collected and updated (Sudibyakto, 1998).

The computerized system of information can be used in disaster management efforts in Indonesia. The Web Browser facility such as Netscape Navigator or Internet Explorer) and files sending facility (FTP = File Transfer Protocol) such as Gopher, Telnet, and Electronic Mail in internet, accelerate the information needed the disaster management efforts. SIPBI is designed to use the statistical data, hazard map, and system procedure in reporting disaster occurrences. The computerized system is expected to accelerate the information and complete the former system in order to minimize the number of causalties and material loss occuring from disaster.

In China the development of Disaster Information Management System (DIMS) is still in progress. DIMS according to Shi Jinming and Zhao Licheng (1998) is a disaster database management application software on Windows 3.x operating system and using the GIS method which integrates five components : hardware, software, data, people, and methods (Jinming and Zholicheng, 1998).

The main purpose of organizing and developing SIPBI is to complete the information system of disaster management based on computer and expected to maximize the performance of disaster management in Indonesia. Therefore, SIPBI (Sudibyakto, 1998) aims at :

1. accelerating the availability of information on disaster management at various phases;
2. maximizing the performance level of Disaster Management Coordinating and Implementing Unit of the Province and the Disaster Management Implementing Unit of the Regency in planning, observing, and evaluating the level of disaster risks; and
3. managing a National Disaster Management Coordination System supported by a computerized system and qualified human resources.

METHOD

Design of SIPBI

As a total unit, the SIPBI design is composed of components which basically can not be separated from each other. These components consist of : (a) the design of hardware and software; (b) the design of organizational management; (c) the design of the form of information; and (d) the design of standard operational procedure (SOP).

The prototype of SIPBI which is designed by the Research Center for Natural Disaster (RCND) of Gadjah Mada University for SATKORLAK PB of the Yogyakarta Special Province for the flood, drought, landslide, and volcanic eruption of the Merapi Volcano includes hardware and software. The hardware computer specifications are CPU (Central Processing Unit) with minimum processor of 486 or pentium i/120; hard disk of 1.6 GB, 16 M in RAM, Modem with the minimum of 28.800 kpbs, printer, digitizer, scanner, and direct telephone line from Telecommunication office. On the other hand the software computer specifications are Windows 97, Netscape Navigator/Internet Explorer, Arc/Info, ArcView as an optional (Sudibyakto and Hadi, P 1999).

At the present time, SIPBI is managed by the RCND of Gadjah Mada University entrusted to the Gama-net (Gadjah Mada Computer Center). The following address of SIPBI is : **http://psba.ugm.ac.id** and the following SIPBI Main screen will display on the screen with main menu, toolbar, and status bar as shown in Figure 1.

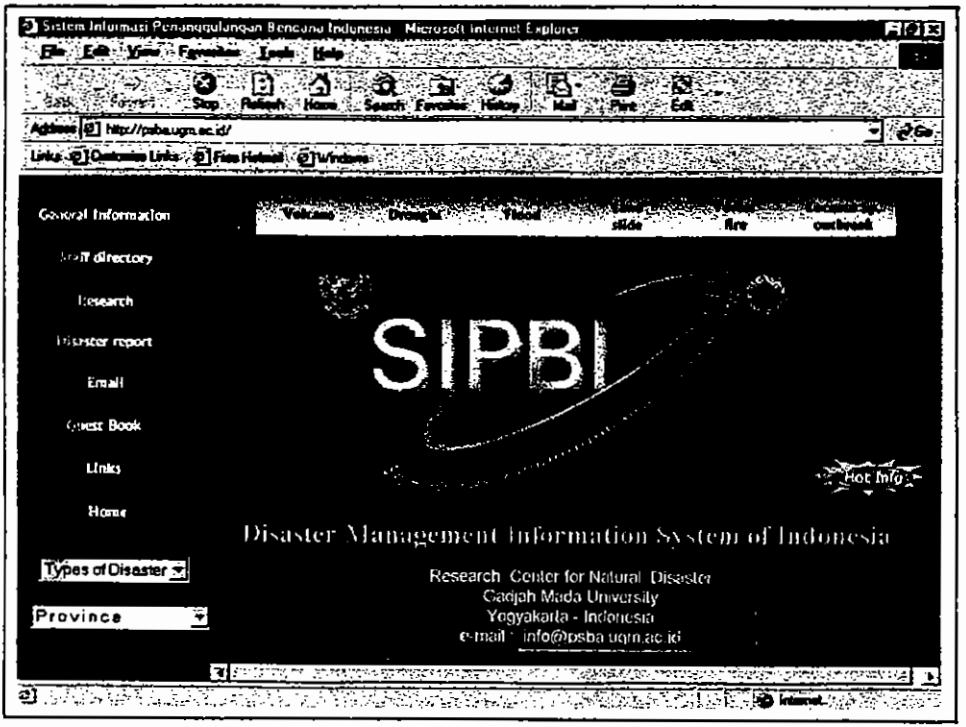

Figure 1. Main Menu of the SIPBI

Considering the main menu of SIPBI as shown in Figure 1, we provide some types of disaster management such as volcanic eruption, drought, flood, landslide, forest fire, earthquake, tsunami, and also the outbreak of Locusta sp. Bakornas (1998) stated that by means of SIPBI, it will be able to enhance its decision making capability besides increasing and ensuring flows of reliable and up to date information on various disaster events and related disaster management measures. For implementing the disaster management, an examples of the result of SIPBI designed for Yogyakarta City can be seen in Figure 2, 3, 4, and 5 respectively.

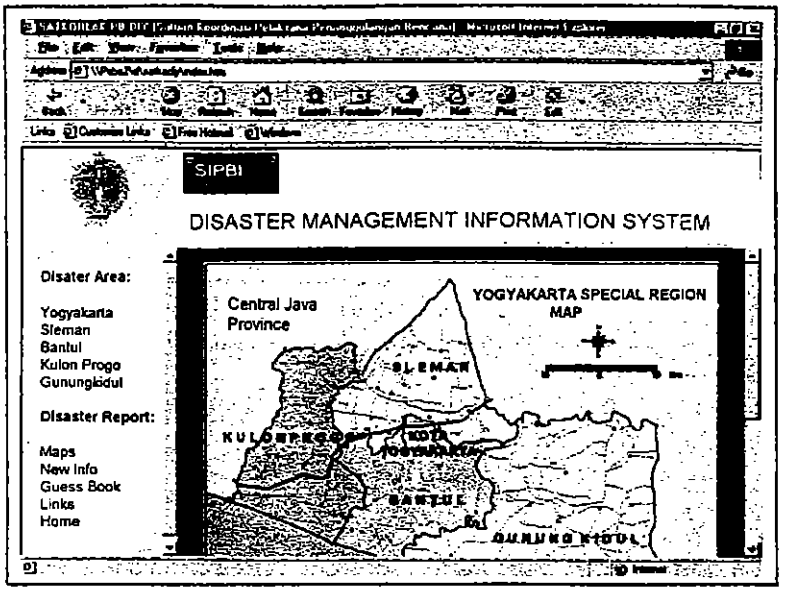

Figure 2. Menu of SIPBI for Yogyakarta Special Region

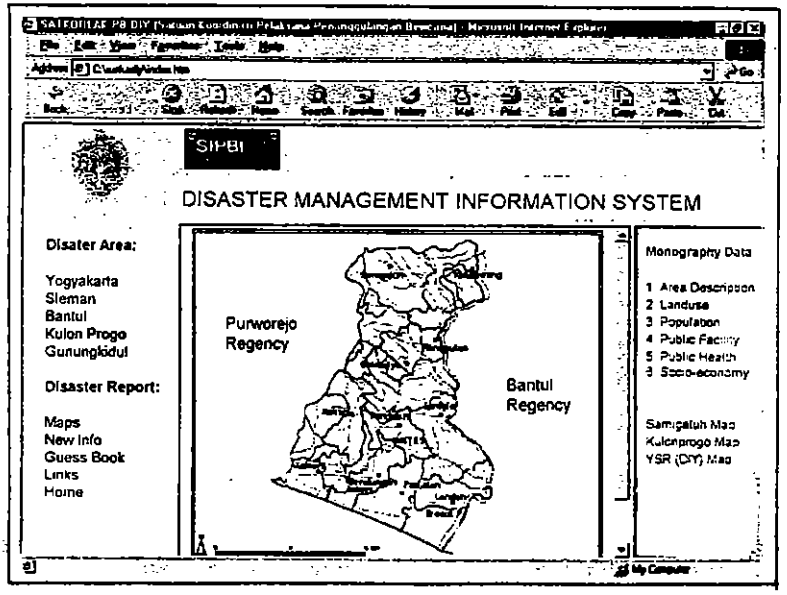

Figure 3. Menu of Kulon Progo Regency Indicating the Flood and Landslide Prone Areas

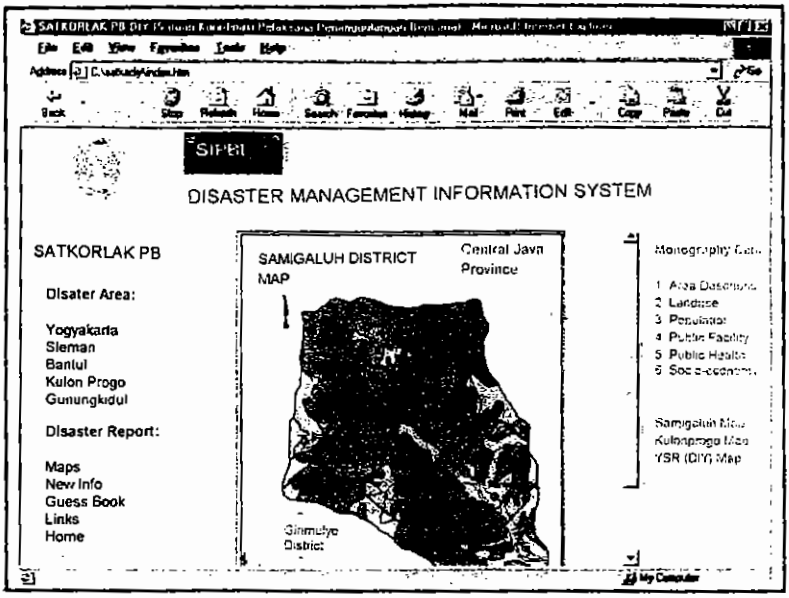

Figure 4. Landslide Risk Map of Samigaluh District in Kulon Progo Regency

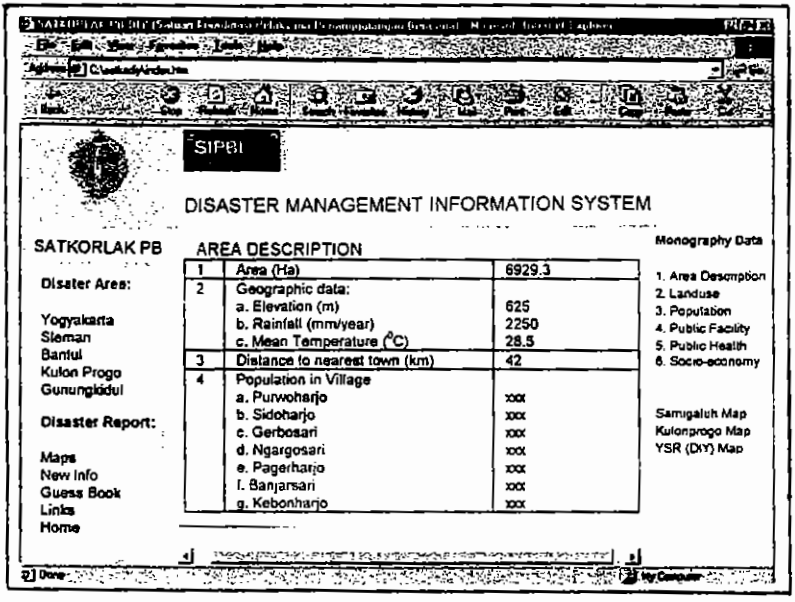

Figure 5. An Example of Geographic/Statistical Data for Supporting Disaster Management

SIPBI Development Program

The development programs of Disaster Management Information System of Indonesia are as follows : (1) the development of computer network, (2) the development of geographic information system for disaster management, (3) the development of disaster management database, and (4) the development of the SIPBI standard operation.

Due to the fact that most departments such as Department of Public Works, Department of Home Affairs, etc. are based on their jobs or tasks and have their own network systems, the development of SIPBI must be based on the following considerations :

a) SIPBI must be able to communicate with the existing information system of the interrelated departments and the local information system (either the SATLAK PB, Disaster Management Implementation Unit);
b) SIPBI must be able to run the application of database using SIG;
c) Well skilled human resources are needed to support the operation of SIPBI. Based on the fact that SIPBI lacks the required human resources who have the capability of operating the computer system, the education and training of the application of SIPBI is continuously needed;
d) SIPBI must be able to combine the computerized information system and the other communication system available. The communication system plays a very important role especially when disaster occurs. For this matter, therefore, SIPBI must be equiped with the data reporting system at the time of disaster occurrence and it ought to utilize the advantage of the existence of electronic mail system (e-mail).

CONCLUDING REMARK

The Application of Geographic Information System for disaster management information system, called SIPBI, is designed as a management system for handling the disaster data and hazard maps in Indonesia. In order to support the disaster management, a geographical data and thematic maps such as flood susceptibility map, etc. are mostly needed. The better performance of disaster management in Indonesia can be achieved not only by development of hardware and software, but also the human resources education and training as well.

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